Royal National Orthopaedic Hospital
NHS Trust

A Patient's guide to

External Fixation for Bone Correction and Lengthening

Introduction

You have been given this booklet because it has been suggested that you have treatment with an external fixator. It has been designed to provide you with general information about how the fixator works, as well as how it will impact on your life. We hope it helps to answer some of your questions. If it does not please do not hesitate to contact us. There is a list of contact numbers on
page 25 of this booklet.

Your participation is essential to the success of your treatment. You will need to manage your pin site care and the adjustment of the frame at home. In order to prevent complications and maintain mobility and movement in your joints it is essential that you perform any exercises suggested by the physiotherapists.

What is an External Fixator?

An external fixator is a device used to stabilise and/or correct the position of a bone. It is attached to the bone using wires or half pins. These pass through the skin, muscles and bone; on some frames the wires pass all the way through the limb.

The main reasons to use an external fixator are: stabilization of a fracture, correction of a bent bone and bone lengthening. The fixators can be adjusted so that complex corrections can be made to the position of the bone.

There are two main types of external fixator used: Monolateral and Circular. The type of frame used depends upon your individual circumstances.

The Monolateral external fixator

Half-pins connect the bone to a strong bar which is placed along one side of a limb. There are several different types. At the RNOH we use one that can be adjusted using an Allen key. (Fig. 1) This allows for changes of the length or position of the bone.

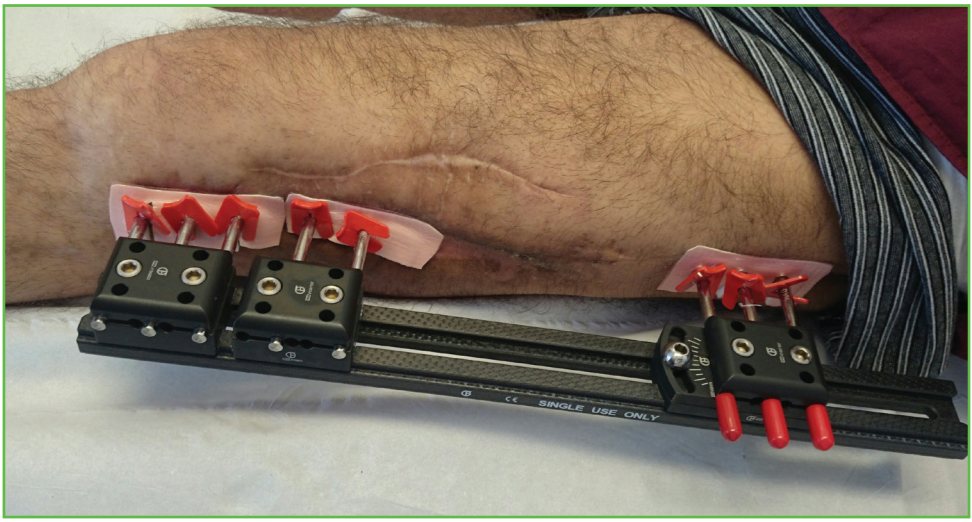

Fig. 1 LRS rail

The Circular external fixator

There are two main kinds: The Ilizarov fixator and the Hexapod.

Each fixator is assembled to your individual needs. The number of rings, wires and half-pins will vary from person to person. Your surgeon will be able to give you an idea of what your frame will look like.

The Ilizarov fixator
This is a frame consisting of rings, which are connected by straight rods. (Fig. 2) The rings are attached to the bone using tensioned wires, these wires pass all the way through the limb. The rods can be finely adjusted to change the length or position of the bone.

Fig. 2 Ilizarov fixator

The Hexapod

Like the Ilizarov fixator, rings are connected to the bone using wires and/or half pins. However, rather than there being straight rods between the rings, there are six telescopic struts. (Fig. 3). Engineers will recognise this as the Gough-Stuart platform, which is often used in machinery and robotics. There are several different types, one such fixator, the Taylor Spatial Frame uses computer software to generate instructions to move each strut in order to improve the position of the bone.

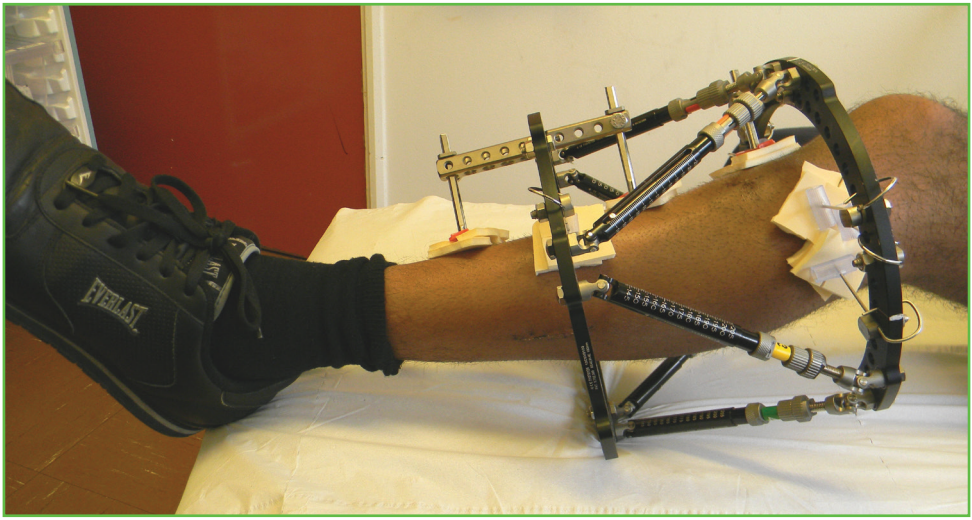

Fig. 3 A Taylor Spatial Frame

Bone correction and lengthening

If your external fixator is being used to correct the position or length of your bone, you will normally start to adjust your fixator 6 - 7 days after your operation. Individual instructions will be given and you will be supported until you feel confident and competent to carry out the adjustments to the frame.

The operation involves the frame being applied and your bone being divided in a specific place. You will have surgical wounds where the wires/half pins have been inserted and where the bone has been divided.

After a week, the division in the bone will be in the early stages of healing. As the bone is pulled apart or moved using the fixator, new bone starts to form along the line of tension created by the fixator and then continues to grow in the gap. (Fig. 4a, 4b). **This is a slow process.** Some procedures can be completed in 4 - 6 months, whilst other more complex procedures may take 12-18 months.

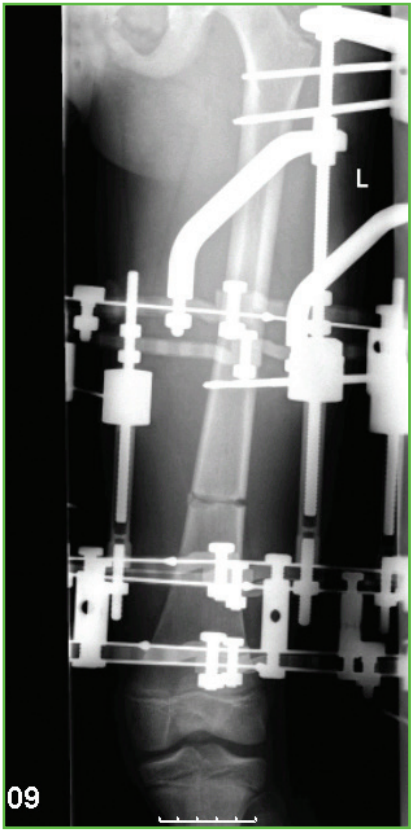

Fig. 4a
X-ray showing the fixator and the divided bone

Fig. 4b
X-ray showing new bone developing. Frame removal is considered when this appears to be the same density as the original bone.

How long does it take?

Your surgeon will be able to give you the approximate time you can expect to have the frame in place. Bone is normally lengthened at a rate of 1mm/day, it then needs to harden (consolidate) before the frame is removed, this takes approximately 2-3 times that was spent on the lengthening.

For example, a 50mm (5cm) lengthening:
Lengthening + consolidation = frame time
50+150=200 days

Every person is different, and the amount of time it takes to lengthen or change the position of your bone may be different to this. You may need to attend clinic every 2 weeks whilst the frame is being adjusted. During this visit you have x-rays to check how well the bone is developing. Based on these x-rays or other symptoms we may slow down the rate at which we adjust the frame, or speed things up.

Once the frame has been removed, you may need to wear a plaster cast or splint for several weeks.

Scarring is an inevitable consequence of having an external fixator. There will be scars where each wire or half pin pass through the skin in addition to any wound. Sometimes these can be unsightly and occasionally require surgery in the future to improve their appearance.

Living with the frame

Pain
You may already be experiencing pain for which you are taking medication. **Please inform nursing and medical staff about these and how effective they have been.**

Immediately following surgery you may have patient controlled analgesia (PCA), the PCA enables you to press a button to feed pain relieving drugs straight into your blood system. Once the initial pain has eased this will be changed to pain killing tablets. On discharge you will be given a week's supply, these should be renewed via your GP. **Do ensure your new supply of medication is ordered before the supply given by the hospital runs out.**

At home you may experience pain during the lengthening or correction process as the bone stretches alongside the nerves, muscles and blood vessels. This can be relieved with the appropriate medication or through changing the rate at which you adjust the frame. Please inform the limb reconstruction team if your symptoms change, or, pain is not controlled.

There are some pain killers that you should avoid as they are thought to interfere with the process of bone healing. These are Non Steroidal Anti-inflammatory Drugs (NSAIDS).

NSAIDS include Diclofenac, Ibuprofen, Ketoprofen, Naproxen, Fluribiprofen, Indomethacin, Mefanamic Acid, Piroxicam. Please note that this is not an exclusive list and that these are generic names and commercial names may be different. Ask your chemist/nurse/GP for help if you are unsure.

Common Emotional Problems

Going into hospital is stressful and it is not unusual for patients undergoing prolonged treatment to experience varying degrees of emotional turmoil. Having an external fixator may be the culmination of many years of treatment and there will be times when you feel it will never end. Reduced mobility will curtail your social life and you will be more dependent on others for your daily needs.

Some patients find the appearance of the frame and pin sites unpleasant and you may find that people will stare at the frame.

Not everyone suffers emotional problems but you should be aware that you can occur and seek advice from your nurse or doctor if you feel you need extra support.

Sleep

Sleeping can be difficult at the beginning but you will find the most comfortable position. We normally recommend placing a pillow between your legs, or arm and trunk, in order to avoid the metal causing injury to your unaffected limb. Bed clothing may also be damaged by the components of the fixator.

Diet

Although you may feel less hungry, it is important to eat well. Make sure you include at least one of the ingredients listed below in each meal to help bone and wound healing.

- Protein (found in meat, fish, cheese, eggs and milk)
- Calcium (milk, cheese, cereals and green vegetables)
- Vitamin C (fruit, fruit juices and green vegetables)
- Vitamin D (Margarine, fish and fish liver oils

Please be aware that some painkillers and restricted mobility can cause constipation. In order to relieve the symptoms of constipation try to drink plenty of water and eat food that contains fibre such as wholemeal cereal, wholemeal bread, fruit and vegetables.

Hygiene

Bathing and showering
You will normally be able to take a shower prior to cleaning your pin sites. You will be given advice on this before you leave hospital. If you wish to have a bath your affected limb should be kept out of the water through using a bath board or by covering it with a waterproof bag. If you are unable to keep your limb out of the water we do not recommend baths as dirty water increases the likelihood of pin site infection.

A non-perfumed moisturiser can be used on the affected limb if your skin is dry, however it should not be rubbed directly into the pin sites.

Toiletting
Most patients with an external fixator will be able to use the toilet in the normal manner; however, some patients with a femoral frame may require a raised toilet seat or toilet frame. The occupational therapists will be able to advise you regarding this.

Clothing

Most clothing can be adapted to fit around the frame. The frames may tear holes and ruin clothes, so whenever possible use older clothing that you don't mind throwing away after treatment is completed.
Jogging trousers with a zip or press studs along one side of the leg can usually fit over a fixator.

Figure 5. Trousers adapted to fit around a circular fixator.

When adapting clothing, the side seam can be split, then either Velcro or tabs can be applied; or alternatively, an additional panel of material added (Fig. 5). It is important not to forget to also adapt your underwear.

If you wish to keep your frame covered, a pillowcase can be adapted by inserting drawstrings at the top and bottom ends. In winter you could use a warmer material.

Footwear may be problematic if you have wires or pins in your foot or very near to the ankle joint. Sometimes an old pair of shoes can be cut in order to enable them to be worn.

Work

You may be able to return to work while the fixator is in place, it very much depends on what your job entails and how you plan to get there. Explain your situation to your employer and check whether they can make special arrangements if you need them. We are happy to help if your employer would like more information. A Fit Note can also be completed by your surgeon stating any special requirements such as the need to keep your limb elevated, or attend regular physiotherapy sessions.

Leisure Time – Sport and Holidays

Your consultant will advise you on when you will be able to go back to playing sport. Swimming is generally permitted at an early stage of treatment, but always check first.

We advise you not to travel too far from home while the fixator is in place; if you want to go away on holiday you should discuss it with your consultant. If you need to travel by aeroplane you will need to explain your situation to the airline.

You should not expose the fixator to extreme temperatures- hot or cold. Scar tissue, either during or following treatment should always be protected from the sun using sun-block.

Complications

Pin site infection
The most common complication of having an external fixator is pin site infection.

Symptoms of a pin site infection may include:

- Increased pain in the area
- Spreading redness of the skin
- Increased discharge or pus (not always present)
- Increased swelling
- Difficulty weight bearing
- You have a temperature or feel unwell.

Pin site infections are treated with oral antibiotics in the first instance. If you suspect you have an infection you should visit your GP at the earliest opportunity for assessment and if necessary, the prescription of antibiotics. It is important that you complete a course of antibiotics once started. If your infection does not respond to antibiotics prescribed by the GP you should contact a member of the Limb Reconstruction Team.

Meticulous pin site care will minimize the risk of pin site infection. You will be shown how to care for your pin sites as well as have some practice whilst you are in hospital. If necessary, we may arrange for some nursing support in the community once you are discharged from hospital.

Joint Stiffness and soft tissue tightness
This can be a problem and may affect your ability to mobilise. It is of prime importance that you perform the exercises that the Physiotherapists provide, or wear any necessary splints as instructed. In severe cases, surgery may be required to release tightness in the soft tissues to allow a full range of movement.

Joint Instability
Following long lengthening procedures there is a small risk of dislocation of the surrounding joint. This particularly applies to the hip and the knee when lengthening a femur and to the knee when lengthening a tibia. This is monitored during the lengthening process and whilst it may be prevented with aggressive physiotherapy, its occurrence may lead to abandoning further lengthening.

Nerve and blood vessel injury
Rarely nerves and blood vessels can become damaged. This can be either at the time of surgery or during the subsequent lengthening or repositioning of the bone. You should inform nursing and/ or medical staff if you experience pain, numbness or pins and needles. Should this occur during the lengthening process this may mean that we slow down the rate of adjustment or even stop lengthening. Usually this wears off, but in some cases it may become permanent. It is important that you inform a member of the Limb Reconstruction Team should these symptoms occur.

Acute Compartment Syndrome

Acute Compartment Syndrome is a painful condition that occurs when swelling or bleeding causes increased pressure within the muscle compartments. It will usually be diagnosed and treated when you are already in hospital, however, it can occur several days after surgery.

The main symptoms are:

- Severe pain which is constant. The pain may worsen upon movement when the muscles are stretched.
- Tingling or burning sensation in the area.
- The skin in the affected area may become pale, cold, tense and hard
- Reduced strength and movement in the affected area

Acute compartment syndrome is a medical emergency. If you experience any of these signs or symptoms, you should inform a member of your consultant's team or attend your local accident and emergency department immediately.

Further information about Acute Compartment Syndrome can be found in the booklet:

'A patients' guide to Acute Compartment Syndrome'

Deep Vein Thrombosis (DVT)
There is a risk of developing a DVT. This is a blood clot which is treated by medication that thins the blood. Your risk factors for this occurring will be assessed by medical staff and if necessary you will be placed on anticoagulation therapy.

Pressure Ulcers
A pressure ulcer is damage to the skin and underlying tissue. They can be caused by pressure, shear or friction.

Pressure ulcers tend to form where bone causes the greatest force on the skin. This is caused when the body is in contact with the mattress, chair or another part of the body. Areas such as the bottom, heel, hip, elbow, ankle, shoulder, back and the back of the head are vulnerable.

They can also be caused if your limb swells excessively within the external fixator causing the skin to be in contact with the clips holding dressings in place or the rings or bars of the fixator.

You should always elevate your limb should it become swollen and ensure the clips holding the dressings in place are not tight or digging into your skin. If your skin is touching the rings or bars of the fixator please inform the Limb Reconstruction Team.

Further information can be found in the leaflet:

'A patients' guide to pressure ulcer prevention'

Failure to gain length/delayed union
This may occur if the bone does not form during lengthening or takes a long time to mature. Other reasons for failure to gain length relate to problems with stretching the nerves, blood vessels and tendons. Your consultant will advise you about treatments should this arise.

Problems with the fixator
Rarely the wires or half pins which attach the fixator to your limb may lose tension or break. If this were to occur, the frame may seem unstable or the pin site become more painful. Should you be concerned regarding this please contact a member of the Limb Reconstruction Team. We may replace, repair or remove a broken wire depending on the stage of treatment.

Refracture
Following removal of the external fixator, fractures are a rare problem. If this were to occur it would possibly require further surgery or a period in a cast or brace.

Can I be worse off?
The worse case scenario is that if there was an uncontrolled infection, damage to the arteries and nerves or interruption of the blood supply to the muscles, there is a risk that this could lead to amputation of the limb.

General advice

Smoking
We strongly advise that you do not smoke or spend any time in a smoky environment. Smoking is known to delay bone healing and increase the risk of complications. There are many options available to help you quit. Your G.P will be able to give you advice or you can contact your local NHS Stop Smoking Service:

For advice, help and support:

Go to www.nhs.uk/smokefree

Please be aware that the RNOH has adopted a no smoking policy. Patients or visitors are requested not to smoke or use electronic cigarettes (e-cigarettes) in the hospital buildings or grounds.

Contraception pill or Hormone Replacement Therapy (HRT)
Women will need to stop taking the pill or HRT six weeks before treatment. Your doctor will have discussed this with you. Care should be taken not to get pregnant and alternative forms of contraception should be used.

Allergies
Please advise nursing or medical staff if you have any allergies.

Medication

Please advise nursing or medical staff if you are taking any medication and have your prescription to hand when attending the pre-admission clinic.

Location of services

All in-patient care takes place at the Stanmore site.

Out-patient visits may be either at the Stanmore site or in central London at Bolsover Street. It is important that you check the location of any clinic appointments.

Hospital stay

You are likely to be in hospital for approximately 1 week after the frame is applied. During this time you will be taught how to care for your external fixator and pin sites and learn how to adjust the frame. You will also receive physiotherapy. The exercises given to you by the physiotherapists are extremely important and will aid you to mobilise and help prevent complications associated with treatment. If appropriate, you may also be reviewed by the Occupational Therapist.

Coming into hospital

You will normally be admitted to the RNOH on the day of your operation. Unless otherwise instructed, you should attend the admission lounge, based in the Outpatient department at 7am. From here you will be assessed and allocated a bed / ward. Full details about coming in to hospital will be given at your pre-operative assessment clinic appointment.

Day of discharge

We will aim to discharge you before 11am. So please ensure that your family member / carer is aware to collect you before this time.

The doctors will have told you when they wish to review you in clinic. The most common time is 2 weeks after the operation, although this can vary for individual patients. If it is possible to make you an appointment before you go home the nurses will inform you of the date, time and venue (your outpatient review may be at either Stanmore or Bolsover Street). If this is not possible, an appointment will be sent to you at home. The outpatient review may take several hours as you will have x-rays, see the Surgeon and also have a pin site/wound review from the nurses. You may also need adjustments to be made to the frame.

The ward nurses will also arrange for any necessary nursing appointments (for example suture removal) to be done either by your district nurse or the nurse at your GP surgery. If you require extra support with your pin site or wound care this will also be organized.

Travel to hospital

Detailed maps of each hospital site as well as advice on public transport and parking can be found on the hospital website: www.rnoh.nhs.uk/home/how-find-us

Car

If you are travelling by car, you may find it easier to sit in the front seat with the seat pushed back, cushions can be used to support your leg. Although we do not recommend that you drive with the apparatus on, some may wish to establish if it is possible for them to do so. In this case, you would need to discuss this with the DVLA and your insurance company.

Certain medicines may affect your ability to drive. It is an offence to drive while your ability is impaired. From 2nd March 2015 a new law was introduced stating that it is an offence to drive with certain drugs above specified blood levels in the body. This includes strong painkillers such as morphine or opiate based medications such as Codeine, Tramadol and Fentanyl. If you are stopped by the police and have taken prescription medication you will need to demonstrate you have been prescribed it for a medical problem and that you took the medicine according to the instructions given by the prescriber.

For more information go to: www.gov.uk/drug-driving-law

Hospital Transport

When booking an appointment or an admission at the Royal National Orthopaedic Hospital's (RNOH) Stanmore site or an appointment at the RNOH's Bolsover Street site, it is your responsibility to make your own way to and from the hospital. If you require transport for medical need only, you will need to contact the transport assessment team for a confidential assessment at least 48hrs before your appointment. You will be screened using a set of questions to establish your mobility and potential for specialist care on the journey.

Please call the transport assessment team Monday-Friday between 09.00 and 17.00 on 0800 953 4138 (the office is not open on bank holidays)

If you would like further details regarding hospital transport, please ask for a copy of:

"A guide to Patient Transport services"

Contact numbers

Your hospital details
Hospital number:
Consultant:
Ward & Ext.:
Nurse Specialist:
Physiotherapist:

Contact numbers

Hospital switchboard:	**020 3947 0100**
Out patient appointments:	**020 8909 5516**
Limb reconstruction team secretary:	**020 8909 5890**
Limb reconstruction nurse specialist:	**020 8385 3012**
Physiotherapy outpatients:	**020 8909 5820**

The limb reconstruction team can also be contacted via email: limbreconstruction@rnoh.nhs.uk

Information booklets are also available on the RNOH website: www.rnoh.nhs.uk/patients-visitors/information-guides

In the event that you are unable to contact a member of the limb reconstruction team and feel that you have an urgent problem, you should visit your GP or local emergency department for advice.

Please note that this is an advisory leaflet only. Your experiences may differ from those described.

Notes

Notes

If you would like this leaflet translated into another language/large print, please contact the Quality Team on 020 8909 5439.

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Date of next review: April 2021
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